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driver 630 is a string type, which is integrated with CPU function. A solar cell 600 is integrated on the substrate as a power source for the whole apparatus. Transmitting and receiving information to/from externals are performed by input/output sensors 610 (for example LED and photodiode) integrated on the substrate. In accordance with the present embodiment, many members, such as the electric power source, the back light, the substrate mounting the control circuits, FPC, and container, can be omitted, and accordingly, the apparatus can be reduced in weight, in size, and in thickness. The portability of the information processor can be improved remarkably. As a similar embodiment, an example which uses a string driver and mounts a CPU630 on the substrate is shown in FIG. 16. FIG. 15 shows an example wherein all elements are integrated on the substrate. In both cases, the portability of the apparatus can be improved remarkably.

As described above, in accordance with the present invention, the active matrix liquid crystal display apparatus can be reduced in size, and the portability of the liquid crystal display apparatus can be improved.

What is claimed is:

1. A liquid crystal display apparatus, comprising:
 - a pair of substrates, at least one of which is transparent;
 - a liquid crystal layer formed by enclosing a liquid crystal composition between said pair of substrates;
 - a display region having a plurality of first semiconductor elements which are arranged in a matrix on one substrate of said pair of substrates;
 - peripheral circuits having a plurality of second semiconductor elements for driving said plurality of first semiconductor elements, arranged at a periphery of said display region, said peripheral circuits are formed on said one substrate of said pair of substrates and at least a part of said peripheral circuit are arranged in a peripheral circuits region which is held between said pair of substrates; and
 - at least one driver circuit which is an integrated circuit for driving said peripheral circuits is formed on said one substrate of said pair of substrates in a driver integrated circuit region which is not held between said pair of substrates.
2. A liquid crystal display apparatus as claimed in claim 1, wherein said first and second semiconductor elements are thin film transistors.
3. A liquid crystal display apparatus as claimed in claim 2, wherein
 - said thin film transistors at the display region have a mobility in a range of $1 \text{ cm}^2/\text{Vs}$ to $5 \text{ cm}^2/\text{Vs}$;
 - said thin film transistors at the peripheral circuits region have a mobility in a range from $10 \text{ cm}^2/\text{Vs}$ to $30 \text{ cm}^2/\text{Vs}$; and
 - the amplitude of a liquid crystal driving voltage of the driver circuit is at most 5 V.
4. A liquid crystal display apparatus as claimed in claim 3, wherein
 - said thin film transistors at the display region have a mobility in a range of $0.7 \text{ cm}^2/\text{Vs}$ to $5 \text{ cm}^2/\text{Vs}$;
 - said thin film transistors at the peripheral circuits region have a mobility in a range from $30 \text{ cm}^2/\text{Vs}$ to $100 \text{ cm}^2/\text{Vs}$; and
 - the amplitude of a liquid crystal driving voltage of the driver circuit is at most 5 V.
5. A liquid crystal display apparatus as claimed in claim 4, wherein

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- said thin film transistors at the display region have a mobility in a range of $0.4 \text{ cm}^2/\text{Vs}$ to $5 \text{ cm}^2/\text{Vs}$;
- said thin film transistors at the peripheral circuits region have a mobility in a range from $100 \text{ cm}^2/\text{Vs}$ to $300 \text{ cm}^2/\text{Vs}$;
- the amplitude of a liquid crystal driving voltage of the driver circuit is at most 5 V; and
- a softening point of said one substrate of said pair of substrates is at most 600°C .
6. A liquid crystal display apparatus as claimed in claim 5, wherein
 - the thin film transistors at said display region have a switching time in a range from $30 \mu\text{s}$ to $60 \mu\text{s}$;
 - the thin film transistors at said peripheral circuit region have a switching time in a range of $3 \mu\text{s}$ to $12 \mu\text{s}$; and
 - said driver circuit has a transistor having a switching time in a range from $0.01 \mu\text{s}$ to $0.03 \mu\text{s}$.
7. A liquid crystal display apparatus as claimed in either of claim 1 or claim 2, wherein
 - said driver is bonded directly to said one substrate of said pair of substrates.
8. A liquid crystal display apparatus as claimed in claim 1, wherein
 - said pair of substrates are made of glass.
9. A liquid crystal display apparatus as claimed in claim 8, wherein
 - said driver is bonded to said one substrate of said pair of substrates by a COG (chip on glass) method.
10. A liquid crystal display apparatus as claimed in claim 1, wherein
 - the number of driver circuits bonded to said one substrate of said pair of substrates is one.
11. A liquid crystal display apparatus as claimed in claim 1, wherein
 - said peripheral circuits region comprises:
 - a signal circuit at an image signal side of said display region for supplying an image signal to said plural first semiconductor elements arranged in said display region; and
 - a signal circuit at a scan signal side of said display region for supplying a scan signal to said plural first semiconductor elements.
12. A liquid crystal display apparatus as claimed in claim 11, wherein
 - the number of driver circuits bonded to said other substrate of said pair of substrates is two, and
 - respective ones of said driver circuits are arranged adjacent to said signal circuit at said image signal side and at said scan signal side of said display region, respectively.
13. A liquid crystal display apparatus as claimed in claim 1, wherein
 - the diagonal length of said display region is in a range from 75 mm to 175 mm; and
 - the distance from the outer periphery of the display region to the outer periphery of the liquid crystal display apparatus is at most 5 mm.
14. A liquid crystal display apparatus as claimed in claim 1, wherein
 - the ratio of the area of said display region to the area of said one substrate of said pair of substrates is in a range from 70% to 95%.
15. A liquid crystal display apparatus as claimed in claim 1, wherein

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the distance between said driver circuit and said peripheral circuit region is at most 1 mm.

16. A liquid crystal display apparatus as claimed in claim 1, wherein
 - a light-shield film is formed on said peripheral circuit region.
17. A liquid crystal display apparatus as claimed in claim 1, wherein
 - a driver circuit is provided at only a short side of said one substrate of said pair of substrates.
18. A liquid crystal display apparatus as claimed in claim 1, wherein
 - a driver circuit is provided at only a long side of said one substrate of said pair of substrates.
19. A liquid crystal display apparatus as claimed in claim 1, wherein
 - a threshold voltage of said liquid crystal layer is at most 2 V.
20. A liquid crystal display apparatus as claimed in claim 1, wherein
 - the active region of said first and second semiconductor elements are made of amorphous silicon and polycrystalline silicon; and
 - the active region of said semiconductor elements comprising said driver circuit is made of single crystalline silicon.
21. A liquid crystal display apparatus according to claim 1, wherein another part of said peripheral circuits is arranged

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in said driver integrated circuit region which is not held between said pair of substrates.

22. A liquid crystal display apparatus comprising:
 - a pair of substrates, at least one of which is transparent;
 - a liquid crystal layer formed by enclosing a liquid crystal composition between said pair of substrates;
 - a display region, having a plurality of first semiconductor elements which are arranged in a matrix is formed on one substrate;
 - a peripheral circuits region having a plurality of second semiconductor elements for driving said plurality of first semiconductor elements, arranged at a periphery of said display region, are formed on said one substrate of said pair of substrates;
 - at least one driver circuit for driving said peripheral circuits bonded at a designated region on said one substrate of said pair of substrates;
 wherein said first and second semiconductor elements are thin film transistors; and
 - the thin film transistors at said display region have a switching time in a range from 30 μ s to 60 μ s;
 - the thin film transistors at said peripheral circuit region have a switching time in a range of 3 μ s to 12 μ s; and
 - said driver circuit has a transistor having a switching time in a range from 0.01 μ s to 0.03 μ s.

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25. A liquid crystal display apparatus according to claim 23, wherein said display region having said plurality of first semiconductor elements has at least one semiconductor island annealed by laser irradiation.

1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283</
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31. A liquid crystal display apparatus according to claim 28, wherein said plurality of second semiconductor elements are thin-film transistors, and said thin-film transistors have a mobility in the range of 100 cm²/Vs to 300 cm²/Vs.

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32. A liquid crystal display apparatus comprising:
a pair of substrates, at least one of which is
transparent;
a liquid crystal layer formed by sandwiching a liquid
crystal composition between said pair of substrates;
a display region having a plurality of semiconductor
elements arranged in a matrix on one substrate of said pair of
substrates;
an image signal peripheral circuit which consists of a
switch matrix connected to said display region on one
substrate of said pair of substrates; and
at least one driver circuit electrically connected to
said image signal peripheral circuit.

33. A liquid crystal display apparatus according to
claim 32, wherein a scanning signal peripheral circuit is
connected to said display region and is formed on one
substrate of said pair of substrates.

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34. A liquid crystal display apparatus according to
claim 32, wherein at least one of said image signal peripheral
circuit and said scanning signal, the peripheral circuit
includes a plurality of semiconductor elements having at least
one semiconductor island annealed laser irradiation.

35. A liquid crystal display apparatus according to
claim 34, wherein the laser irradiation is excimer laser
irradiation.

36. A liquid crystal display apparatus according to claim 35, wherein the laser irradiation is provided by an XeCl excimer laser.

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bv { 37. A liquid crystal display apparatus according to claim 36, wherein said switch matrix comprises thin-film transistors, and said thin-film transistors have a mobility in the range of 100 cm²/Vs to 300 cm²/Vs.

38. A liquid crystal display apparatus comprising:
a pair of substrates, at least one of which is transparent;

a liquid crystal layer formed by enclosing a liquid crystal composition between said pair of substrates;

a display region having a plurality of semiconductor elements arranged in a matrix form on one substrate of said pair of substrates;

at least one image signal peripheral circuit having a switch matrix connected to said display region; and

at least one driver circuit, including at least one display information generating circuit, electrically connected to said at least one image signal peripheral circuit.

39. A liquid crystal display apparatus according to claim 38, wherein said at least one image signal peripheral circuit includes a plurality of semiconductor elements having at least one semiconductor island annealed by laser irradiation.

40. A liquid crystal display apparatus according to claim 39, wherein the laser irradiation is provided by an excimer laser.

41. A liquid crystal display apparatus according to claim 37, wherein said excimer laser is a XeCl excimer laser.

42. A liquid crystal display apparatus comprising:
a pair of substrates, at least one of which is transparent;

a liquid crystal layer formed by sandwiching a liquid crystal composition between said pair of substrates;

a display region having a plurality of first semiconductor elements arranged in a matrix form on one substrate of said pair of substrates; and

an image signal peripheral circuit having a switch matrix connected to said display region;

wherein only one driver circuit is electrically connected to said image signal peripheral circuit for generating clock pulses and analog image signals.

43. A liquid crystal display apparatus according to claim 42, wherein said image signal peripheral circuit includes a plurality of semiconductor elements having at least one semiconductor island annealed by laser irradiation.

44. A liquid crystal display apparatus according to claim 43, wherein the laser irradiation is provided by an

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excimer laser.

45. A liquid crystal display apparatus according to claim 44, wherein said excimer laser is a XeCl excimer laser.

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